

PATENT ABSTRACTS OF JAPAN

(11) Publication number : 2002-139392

(43) Date of publication of 17.05.2002
application :

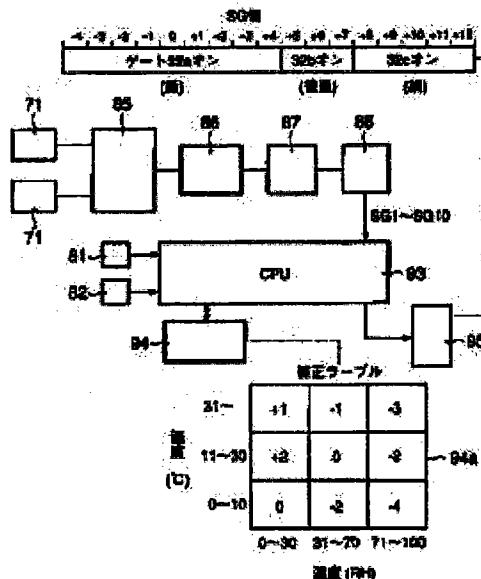
(51) Int. Cl. G01L 5/00
 B65H 7/02
 B65H 29/60
 G01B 7/34
 G07D 7/00

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number : nt :(22) Date of filing : 01.11.2000 (72) Invento FUKATSU KUNIO
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(54) PAPER SHEET TEXTURE DETECTING DEVICE AND PAPER SHEET PROCESSING DEVICE

(57) Abstract:

PROBLEM TO BE SOLVED: To accurately detect texture of a paper sheet, without being influenced by the temperature and humidity of the environment.



SOLUTION: This paper sheet texture detecting device and paper sheet processing device is provided with a drive roller 20 and a detecting roller 21 disposed in a device body 1 for holding and feeding a bill P, a piezoelectric element 71 for measuring force transmitted from a surface of the bill P via the detecting roller 21 and detecting the texture of the bill P, a temperature sensor 81 and a humidity sensor 82 for measuring at least either the temperature or the humidity inside of the device body 1, and a CPU 93 for

correcting the detection value detected by the piezoelectric element 71, by adding or subtracting the measurement value measured by the temperature sensor 81 and the humidity sensor 82 as a correction value.

CLAIMS

[Claim(s)]

[Claim 1]A detection means for it to be provided in a device main frame, to measure power transmitted from the surface of said paper leaf via one roller of a roller pair which pinches and conveys paper leaf, and this roller pair, and to detect textures of said paper leaf, A textures sensing device of paper leaf possessing a measuring means which measures either [at least] temperature of a peripheral part of the inside of said device main frame, or a device main frame, or humidity, and a compensation means which amends a detection value detected by said detection means based on measured value measured by said measuring means.

[Claim 2]A textures sensing device of the paper leaf according to claim 1, wherein said compensation means subtracts and adds measured value measured by said measuring means by detection value detected by said detection means and amends said detection value.

[Claim 3]A textures sensing device of the paper leaf according to claim 1, wherein said detection means has a piezoelectric element and detects surface roughness of said paper leaf.

[Claim 4]A textures sensing device of the paper leaf according to claim 1, wherein said detection means has a wire strain gage and detects the rigidity of said paper leaf.

[Claim 5]A seat part which is provided in a device main frame and accommodates paper leaf collectively, and a delivery means which dissociates one sheet at a time and lets out paper leaf from this seat part, A positioning means which positions a position of a direction which intersects perpendicularly with a transportation direction of paper leaf conveyed by transportation means which conveys paper leaf which it let out by this delivery means, and this transportation means to a prescribed position, A detection means to detect textures of paper leaf by which it was provided in a position of a direction which intersects perpendicularly with a transportation direction of said paper leaf, and a carrying position was positioned by said positioning means, A variable means into which a conveying path of said paper leaf is made to change according to textures

of paper leaf detected by this detection means, Provide an accumulation means which carries out Type accumulation of the paper leaf into which a conveying path was changed by this variable means, and said detection means, A roller pair which pinches and conveys said paper leaf, and a primary detecting element which measures power transmitted from the surface of said paper leaf via one roller of this roller pair, and detects textures of said paper leaf, A processing unit of paper leaf possessing a measuring means which measures either [at least] temperature of a peripheral part of the inside of said device main frame, or a device main frame, or humidity, and a compensation means which amends a detection value detected by said detection means based on measured value measured by said measuring means.

[Claim 6]A seat part which accommodates paper leaf collectively, and a delivery means which dissociates one sheet at a time and lets out paper leaf from this seat part, A transportation means which conveys paper leaf which it let out by this delivery means, and a detection means to detect textures of paper leaf conveyed by this transportation means, A variable means into which a conveying path of said paper leaf is made to change according to textures of paper leaf detected by this detection means, Provide an accumulation means which carries out Type accumulation of the paper leaf into which a conveying path was changed by this variable means, and said detection means, A roller pair which pinches and conveys said paper leaf, and a primary detecting element which measures power transmitted from the surface of said paper leaf via one roller of this roller pair, and detects textures of said paper leaf, A measuring means which has a temperature sensor which is formed near this primary detecting element and measures the surrounding temperature, and a humidity sensor which is formed near said stowage and measures the surrounding humidity, A processing unit of paper leaf possessing a compensation means which amends a detection value detected by said detection means based on measured value measured by said measuring means.

[Claim 7]A processing unit of the paper leaf according to claim 5 or 6, wherein said compensation means subtracts and adds measured value measured by said measuring means by detection value detected by said detection means and amends said detection value.

[Claim 8]A processing unit of the paper leaf according to claim 5 or 6 said primary detecting element's having a piezoelectric element, and detecting surface roughness of said paper leaf.

[Claim 9]A processing unit of the paper leaf according to claim 5 or 6 said

primary detecting element's having a wire strain gage, and detecting the rigidity of said paper leaf.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the textures sensing device of paper leaf and the processing unit of paper leaf which detect the surface roughness of a bill, or the rigid (chewiness) size of a bill.

[0002]

[Description of the Prior Art] The bill is used in all scenes as a payment system of economic dealings in in the city. For example, if a new bill is published from the bank of issue, this bill will move between a commercial bank, a company, a commercial company, individuals, etc. The bill is worn out small [every] by this movement and maintenance. On the other hand, a bill is treated with many mechanical apparatus, such as ATM and a ticket machine. In a mechanical apparatus, a bill needs to be the gestalt where consumption was stabilized as much as possible few because of reliability maintenance of a device.

[0003] For this reason, the art of making it not make the intense bill of consumption feeding into a mechanical apparatus is needed. That is, the paper leaf consumption sorter which measures consumption of a bill and is classified into the bill worn out and the bill which has not been worn out is demanded.

[0004] However, it is difficult to be quantitative and to make the qualitative characteristic of consumption of a bill into the Measurement Division possible value. In this conventional kind of device, it uses that change of the transmitted light of the space of a bill or catoptric light has consumption and relation of a bill, or since the rigidity (chewiness) of paper falls by consumption, change of the acoustic feature due to the fall of chewiness is used.

[0005] Since such measured magnitude is not necessarily directly related to consumption, it has a field used as a different judging standard from the consumption which human being senses. For this reason, consumption is measured more directly and it waits for the appearance of the device which can classify a bill according to that judgment. That is, the right disadvantage Type machine near human being's feeling to which stable

detection is made is called for at the spot of bill processing from the rate scale depending on the organic functions of right loss which are hard to quantify.

[0006]By the way, the greatest feature of the textures of a bill is the rigidity (called chewiness) of a granulative feeling and the bill itself by intaglio printing. The device which enabled it to measure the granulative feeling of this bill and rigidity is put in practical use in recent years. This device makes a contact roller contact on the surface of a bill, and measures a granulative feeling and rigidity by measuring the power generated in this contact roller. Measurement of the power by this contact roller is well in agreement in sensuous evaluation of human being.

[0007]

[Problem(s) to be Solved by the Invention]However, in order that the number of tribometers might change with temperature or humidity since the minute power by contact friction is measured if it is in some which measure unevenness of intaglio printing, there were a problem that an output changes with installed environment of apparatus, and a problem that an output changed with positions of printing of a bill.

[0008]Even if it is in some which measure the chewiness of a bill, when a bill absorbs moisture, rigidity falls and there is a problem that an output changes or chewiness changes in a portion with printing of a bill and the portion of a watermark. It is the problem of specifically being judged with maculature even if the chewiness of a bill falls and it is a comparatively beautiful bill when the humidity of summer is high, or judging what the chewiness of a bill goes up, and should be conversely judged at the dry stage of winter to be maculature if it is original to be right paper.

[0009]That is, without an output changing with temperature and humidity, if it is in the device which measures printing of space, and the chewiness of a bill by measurement of the power by a contact roller, in order that a measuring point may change, the high device of reproducibility which has not said that an output changes is called for.

[0010]This invention was made paying attention to the above-mentioned situation, and an object of this invention is to provide the textures sensing device of paper leaf and the processing unit of paper leaf which always measure the same part and enabled it to detect the textures of paper leaf with sufficient accuracy without being influenced by an environmental temperature and humidity.

[0011]

[Means for Solving the Problem] In order that this invention may solve an aforementioned problem, the thing according to claim 1, A detection means for it to be provided in a device main frame, to measure power transmitted from the surface of said paper leaf via one roller of a roller pair which pinches and conveys paper leaf, and this roller pair, and to detect textures of said paper leaf, A measuring means which measures either [at least] temperature of a peripheral part of the inside of said device main frame or a device main frame or humidity, and a compensation means which amends a detection value detected by said detection means based on measured value measured by said measuring means are provided.

[0012]A seat part which the thing according to claim 5 is provided in a device main frame, and accommodates paper leaf collectively, A delivery means which dissociates one sheet at a time and lets out paper leaf from this seat part, and a transportation means which conveys paper leaf which it let out by this delivery means, A positioning means which positions a position of a direction which intersects perpendicularly with a transportation direction of paper leaf conveyed by this transportation means to a prescribed position, A detection means to detect textures of paper leaf by which it was provided in a position of a direction which intersects perpendicularly with a transportation direction of said paper leaf, and a carrying position was positioned by said positioning means, A variable means into which a conveying path of said paper leaf is made to change according to textures of paper leaf detected by this detection means, Provide an accumulation means which carries out Type accumulation of the paper leaf into which a conveying path was changed by this variable means, and said detection means, A roller pair which pinches and conveys said paper leaf, and a primary detecting element which measures power transmitted from the surface of said paper leaf via one roller of this roller pair, and detects textures of said paper leaf, A measuring means which measures either [at least] temperature of a peripheral part of the inside of said device main frame or a device main frame or humidity, and a compensation means which amends a detection value detected by said detection means based on measured value measured by said measuring means are provided.

[0013]A delivery means which the thing according to claim 6 separates [each] one paper leaf from a seat part which accommodates paper leaf collectively, and this seat part, and it lets out, A transportation means which conveys paper leaf which it let out by this delivery means, and a

detection means to detect textures of paper leaf conveyed by this transportation means, A variable means into which a conveying path of said paper leaf is made to change according to textures of paper leaf detected by this detection means, Provide an accumulation means which carries out Type accumulation of the paper leaf into which a conveying path was changed by this variable means, and said detection means, A roller pair which pinches and conveys said paper leaf, and a primary detecting element which measures power transmitted from the surface of said paper leaf via one roller of this roller pair, and detects textures of said paper leaf, A measuring means which has a temperature sensor which is formed near this primary detecting element and measures the surrounding temperature, and a humidity sensor which is formed near said stowage and measures the surrounding humidity, A compensation means which amends a detection value detected by said detection means based on measured value measured by said measuring means is provided.

[0014]

[Embodiment of the Invention]Hereafter, this invention is explained in detail with reference to the embodiment shown in Drawings.

[0015]Drawing 1 is a side view showing the right disadvantage sorting device of the bill as a paper sheet processing device which is the 1 embodiment of this invention.

[0016]One in a figure is a device main frame, and the bill mounting base 2 as a bill stowage in which the bill P as paper leaf is laid is formed in the transverse-plane approximately center part of this device main frame 1. The backup plate 3 which pushes in the bill P is formed in the bill mounting base 2. The backup plate 3 is supported pivotally by the axis 4, enabling free movement to a cross direction. The extraction roller 5 as a delivery means is formed in the pushing direction of the bill P.

[0017]The drive motor 8 is connected to the extraction roller 5 via the belt 6 and the belt pulley 7. The bill P consists a prescribed interval by rotation of the extraction roller 5, and one sheet is sent out at a time to the transportation means 9. The transportation means 9 is constituted by the belt 11 over which the roller 10 and this roller 10 are built. The drive motor 15 is connected to the roller 10 via the belt 13 and the belt pulley 14, and the bill P can be conveyed now with constant speed. The posture correction device 17 as a positioning means which amends the posture of the bill conveyed is formed in the halfway part of this transportation means 9.

[0018]The driving roller 20 is formed in the taking-out side of the transportation means 9, and this driving roller 20 is rotated with the above-mentioned drive motor 15. The driving roller 20 is countered and the detecting roller 21 which is an important section of this invention is formed. The conveying roller pair is constituted by the driving roller 20 and the detecting roller 21. The detecting roller 21 is attached to the lower end part of the rotation lever 23, enabling free rotation. The rotation lever 23 is supported by the pivot 24, enabling free rotation, and, as for the upper bed part side, is energized by the spring material 26. The detecting roller 21 is elastically welded by pressure by energization of the spring material 26 to the driving roller 20.

[0019]The inspection device 27 which judges the ticket type of a bill is formed in the upper portion of the detecting roller 21 and the driving roller 20. The inspection device 27 judges the ticket type of the bill P with a various sensor while conveying the bill P by the roller pair 28. The transportation means 30 is formed in the upper portion of the inspection device 28. The transportation means 30 is constituted by the belt 32 over which the roller 31 and this roller 31 are built. The gating arrangements 32a-32c as a variable means are allocated by this transportation means 30 along the transportation direction of a bill, and the bill P can be classified into the accumulation parts 33a-33d according to that kind or right loss, and can be taken out now. The accumulation parts 33a-33d are allocated in the front surface upper part side of the device main frame 1.

[0020]On the other hand near the detection roller 21, the temperature sensor 81 as a measuring means which detects the surrounding temperature is formed, and the humidity sensor 82 as a measuring means which detects the surrounding humidity is formed near the bill mounting base 2. The surface of the detection roller 21 is a product made of rubber, and since a coefficient of friction changes easily depending on temperature, it has formed the temperature sensor 81 near the detection roller 21. Since the chewiness of the bill P tends to be influenced by humidity, it has formed the humidity sensor 82 near [on which the bill P is put] the mounting base 2.

[0021]Drawing 2 is a perspective view showing the posture correction device 17, and drawing 3 is the top view.

[0022]The posture correction device 17 is provided with the 1st and 2nd amendment parts 36 and 37 on ** 1 SU 35. Since the 1st and 2nd amendment

parts 36 and 37 are constituted similarly, they explain only the 1st amendment part 36.

[0023]The 1st amendment part 36 had the frame 38 which carried out the reverse gate type, and the side plates 38a and 38a have risen in the position in which this frame 38 is larger than the conveying width of the bill P. It is built over the shaft 39a of the driving roller 39 between the side plate 38a of the right and left of the frame 38, and 38a. The end part of the shaft 39a is held by the bearing 40, and the drive motor 42 is directly linked with the other end. The surface of the driving roller 39 is covered with rubber, and the coefficient of friction is increasing.

[0024]The rubber roller 43 is contacted by the driving roller 39. This rubber roller 43 is held via the bearing 44 at the axis 45, enabling free rotation. This axis 45 is inserted in the oblong hole 46 of the side plates 38a and 38a of the right and left of the frame 38, and is caudad energized by the spring 47. The bill P is firmly clamped by the driving roller 39 and the rubber roller 43, and is conveyed.

[0025]On the other hand, the gate type frame 38 is supported by the upper bed part of the axis 50 so that it can rotate focusing on the point 49 that the center line of a carrying path and the axis of the driving roller 39 cross seen from the upper part, and the axis 50 is held with the housing 51, enabling free rotation. The servo motor 55 is connected to the lower end part of the axis 50 via the belt pulley 52, the belt 53, and the belt pulley 54. To the posture correction device 17, the three transportation belt pairs 57 which carry out pinching conveyance of the bill P penetrate, and are constructed, and it is set up so that the clamping force of the roller pairs 39 and 43 may become strong rather than the bill pinching power of the three transportation belt pairs 57. The transmission type optical sensor array 58 which detects the bill P optically is allocated by the entrance side of the posture correction device 17, and the sensor 59 which is located in the central part of a carrying path near the 2nd amendment part 33, and detects the bill P optically is formed.

[0026]Drawing 4 shows the posture of the bill P picked out from the bill mounting base 2.

[0027]That is, since bill P metallurgy tickets differ in size by the face value, if it is collectively set to the bill mounting base 2 by them, even if it will arrange it by hand, a small ticket is buried into the maximum size and a position gap of right and left and a possibility of being slanting become high.

[0028]That is, although there are few tickets (henceforth FR) of the medium size which carries out top and bottom for reverse by public, they are carrying out the right skew of the position gap of right and left. For [following this FR ticket] back, direction of top and bottom is carrying out the position shift of the normal ticket (henceforth BF) to left-hand side, and is carrying out the left skew to it. The ticket (henceforth BR ticket) which considers direction of top and bottom as for reverse for [following this BF ticket] back does not have a skew or position gap, either. The ticket taken out following BR ticket has normal direction of top and bottom public, and is called FF ticket.

[0029]Drawing 5 is a block diagram showing the drive control system of the posture correction device 17.

[0030]The transmission type optical sensor array 58 and the sensor 59 are connected to the control means 61 via a signal transmission circuit, and the 1st and 2nd amendment parts 36 and 37 are connected to the control means 61 via the control circuit. According to the optical sensor array 53 and the bill detection signal of the sensor 54, operation of the 1st and 2nd amendment parts 36 and 37 is controlled by the control means 61, and the posture of the bill P is amended.

[0031]Drawing 6 is a top view showing the posture correction operation of the bill P.

[0032]A posture is detected by the transmission type light sensor array 53, and, as for the bill P sent to the posture correction device 17, position gap ΔS_{mm} and the angle of skew theta 1 from a conveyance center line are calculated from this detection result. Subsequently, theta 2 which becomes $\tan \theta_2 = \Delta S / L$ is calculated by setting width of the bill P to L. And only this angle of theta 2 rotates the servo motor 55 so that the 1st amendment part 36 may be rotated in the direction of arrow a. Thereby, the bill P is moved in the direction shifted angle theta2 to the transportation direction by rotation of the 1st amendment part 36, with the angle of skew maintained, and a position gap is amended.

[0033]Subsequently, if the tip of the bill P passes the sensor 59, predetermined timing will be taken and the 2nd amendment part 37 will rotate only the angle theta 1 in the direction of arrow b. Thereby, pinching conveyance of the bill P is carried out by rotation of the rollers 39 and 43, and a skew is amended.

[0034]It is conveyed by the following detecting roller 21, maintaining a right position in the case of the bill P without a skew or a position gap,

as shown in drawing 3 without rotating the 1st and 2nd amendment parts 36 and 37. By this posture amendment, the bill P is conveyed in the state where there is neither a skew nor a shift in the detecting roller 21.

[0035]Drawing 7 is a front view showing the above-mentioned driving roller 20 and the detecting roller 21.

[0036]The detecting rollers 21 and 21 are held with the colors 65a-65c and the snap ring 66 at the fixed axis 64, enabling free rotation. The arm 67 on either side is built over the fixed axis 64.

[0037]Drawing 8 is a sectional side elevation showing the detecting roller 21.

[0038]It comprises the inner ring 67 and the outer ring of spiral wound gasket 68, and can be freely rotated by the inner ring 67 on the axis 64, and the detecting roller 21 serves as plain bearing. The inner ring 67 and the outer ring of spiral wound gasket 68 are joined with the elastic body 69. The end part of the piezoelectric element 71 pasted the slot 70 of the inner ring 67, and the other end of the piezoelectric element 71 is pasted up on the end 72 of the outer ring of spiral wound gasket 68.

[0039]If the outer ring of spiral wound gasket 68 elastically joined to the inner ring 67 receives power in a hand of cut, compression stress will work to the piezoelectric element 71, and the voltage V will occur. This voltage signal is sent to a controller with the collector ring 73. It is made hard to cover the surface of the outer ring of spiral wound gasket 68 with the rubber material 74 with thin thickness, to raise the surface drag coefficient of a roller, and to slip by contact with the bill P.

[0040]The bill P is pinched by the detecting roller 21 and the driving roller 20, and is conveyed by rotation of the driving roller 20. The detecting roller 21 takes by conveyance of this bill P, and the surroundings carry out. At this time, detailed unevenness exists in the surface of the bill P by printing or corruption of a bill itself [wrinkles and], and the vibration relevant to this unevenness is outputted to it by the piezoelectric element 71.

[0041]Drawing 9 is a lineblock diagram showing the detection processing circuit which detects the surface roughness of the bill P.

[0042]The piezoelectric elements 71 and 71 are connected to CPU93 as a compensation means via the amplifying circuit 85, the frequency analysis circuit 86, the band pass filter, the integrator 87, and the threshold circuit 88. The above-mentioned temperature sensor 81 and the humidity sensor 82 are connected to CPU93, and the storage parts store 94 is connected

further. The table 94a of the correction value determined with the detected temperature and humidity is established in the storage parts store 94. The gates 32a-32c are connected to CPU93 via the gate drive circuit 95.

[0043]Next, the right disadvantage discriminating operation of the bill P is explained.

[0044]Although this Type machine can perform classification of a ticket type, classification of a rear surface, calculation of number of sheets, etc. by the operation mode, the case where the same ticket type is classified into a right ticket and an extremely worn note here is explained.

[0045]Passage of the detecting roller 21 of the bill P with which it was taken out by rotation of the extraction roller 5, and the posture was amended with the posture correction device 17 will obtain an oscillatory wave form by the piezoelectric elements 71 and 71. A waveform as this oscillatory wave form amplified by the amplifying circuit 45, for example, shown in drawing 12 or drawing 14 is acquired. Subsequently, the output distribution according to each frequency as shown in drawing 13 or drawing 15 in the frequency analysis circuit 46 is acquired. In the appropriate back, the output of a specific frequency domain integrates a band pass filter and the integrator 47. And in the threshold circuit 48, the size judgment of this integral value is carried out with a predetermined threshold, and ten steps of signals of SG1 - SG10 are outputted.

[0046]The output integral value of a specific frequency domain is large, namely, signal SG1 is carrying out big vibration by the minute projection of the intaglio, and the waveform shown in drawing 13 is acquired. This waveform is a new bill and the projection of the intaglio is attached firmly. That is, a bill is a new article and is a signal which should be judged to be a right ticket.

[0047]The output integral value of the frequency domain where SG10 is specific is small, namely, the minute projection of an intaglio wears out, there is little minute vibration, and the waveform shown in drawing 15 is acquired. This waveform is a signal which the bill is worn out and should be judged to be a ticket with the highest degree of corruption.

[0048]It is sent into CPU93, the data of the temperature sensor 81 and the humidity sensor 82 is also incorporated simultaneously with this, and this right disadvantage signal SG value contrasts the compensation table 94a of the storage parts store 94, and subtracts and adds the correction value as each temperature requirement and each humidity requirement to a previous SG value. This correction value normalizes the relation of the output of

temperature and a detection roller shown in drawing 10, and the relation of the humidity and the output of a detection roller which are shown in drawing 11. Since the compensation table 94a changes with the quality of a rubber material of the detection roller 21, and surface roughness, it sets experimentally beforehand. In the case of other materials, it is necessary to also change the compensation table.

[0049]Corresponding to this amended SG value, the gate drive circuit 85 is controlled according to the compensation table 94a of drawing 9 to drive the gates 32a-32c to carry out classification accumulation with a new ticket, a common ticket, and an extremely worn note greatly. Thereby, the bill P is arranged and accumulated by the pockets 33a-33c. However, a ticket type is judged in the audit part 28, and a different ticket type and the thing which had the reading impossible ticket distinguished are treated as an exclusion ticket, and is accommodated in the pocket 33d.

[0050]As described above, it has the temperature sensor 81 and the humidity sensor 82 which measure temperature and humidity, The textures of the bill P can be detected without being influenced by temperature and humidity, since the measured value measured with this temperature sensor 81 and humidity sensor 82 is subtracted, added and amended to the detection value of the textures of the bill P detected by the detecting roller 21. Therefore, right loss of the bill P cannot be incorrect-judged like before, and discriminating precision can be improved. It may be made to carry out the multiplication not only of addition and subtraction but the predetermined coefficient value.

[0051]Since it sends to the detecting roller 21 after positioning the carrying position of the bill P to a prescribed position with the posture correction device 17, the same position of the bill P can always be detected and discriminating precision can be improved further.

[0052]Since the temperature sensor 81 is formed near the detecting roller 21 and the humidity sensor 82 is formed near the bill mounting base 2, the temperature and humidity which affect the bill P most can be detected, and discriminating precision can be improved further.

[0053]Drawing 16 shows a 2nd embodiment of this invention.

[0054]This 2nd embodiment is a device which detects the rigidity of the bill P.

[0055]By a correction circuit, the influence of temperature and humidity is avoidable like a 1st embodiment that also described this 2nd embodiment above.

[0056]That is, the detection roller 105 of drawing 16 is installed in the same position instead of the detection roller 21 of drawing 2, and has the follower roller 107 which counters the drive roller 106 currently rotated with the drive motor 15. In the drive roller 106, it has the two rubber rollers 106A and 106B which have the slot 109 in the center, and the follower roller 107 is attached to the frame 110 via the metal fittings 111.

[0057]That is, the rubber roller 113 is attached to the metal fittings 111 via the bearing 112, and this rubber roller 113 is energized by the spring 26 toward the rubber rollers 106A and 106B. **** conveyance of the bill P is carried out by this by the rubber roller 113, 113 and the rubber rollers 106A and 106B.

[0058]The small roller 114 of two right and left is attached to the outside of this rubber roller 113, 113 via the bearing 115 at the cantilever Hari-like axis 116. The portion corresponding to the slot 109 of the drive rollers 106A and 106B of the small roller 114 serves as a size with which the periphery stuffs the bill P into the slot 109 circularly slightly. Since change of this size affects detection precision, the deviation from circular form of the roller 114 is high, and he is trying for eccentricity to decrease.

[0059]if the bill P passes through between the small roller 114, 114 and the drive rollers 106A and 106B -- the strength of the chewiness (rigidity) of the bill P -- the slot 109 of the bill P -- it puts and a lump degree changes. This pushing degree is detected with the stone gauge 117 attached to the axis 116. If the chewiness of the bill P is strong, it will become difficult to push in, distortion of the strain gage 117 becomes large, and distortion will become small if limp. Since this is proportional to the right disadvantage degree of the bill P, it takes this out as an SG value signal explained in the 1st working example.

[0060]Also in this 2nd embodiment, since an SG value signal is influenced by temperature and humidity, the SG value signal which carries out as a 1st embodiment that described that amendment above explained, and is not influenced by temperature and humidity is outputted.

[0061]Since this method measures the chewiness of the narrow range of the bill P, in a portion with printing of a bill, and a portion without printing, it has a problem from which a value changes and always needs to measure the same part. Then, when the posture correction device 17 of the preceding paragraph always amends the shift of a skew or right and left, he is trying for this embodiment to also always measure the same part of the bill P.

This contributes to the reproducibility guarantee of a sensor.

[0062]

[Effect of the Invention] This invention is provided with the measuring means which measures either [at least] temperature or humidity as explained above, The textures of paper leaf can be detected without being influenced by temperature or humidity, since the measured value measured by this measuring means is subtracted, added and amended to the detection value of the textures of the paper leaf detected by the detection means.

[0063]Therefore, right loss of paper leaf cannot be incorrect-judged like before, and discriminating precision can be improved.

[0064]Since it sends to a detection means after positioning the carrying position of paper leaf to a prescribed position by a positioning means, the same position of paper leaf can always be detected and discriminating precision can be improved further.

[0065]Since a temperature sensor is formed near the primary detecting element and a humidity sensor is formed near the stowage, ** which detects the temperature and humidity which affect it most is made to paper leaf, and discriminating precision can be improved further

[Brief Description of the Drawings]

[Drawing 1]The rough lineblock diagram showing the right disadvantage sorting device of the bill which is the 1 embodiment of this invention.

[Drawing 2]A posture correction device which amends the transportation attitude of a bill.

[Drawing 3]The top view showing a posture correction device.

[Drawing 4]The perspective view showing the state of the bill taken out.

[Drawing 5]The block diagram showing the drive control system of a posture correction device.

[Drawing 6]The top view showing the posture correction operation of a bill.

[Drawing 7]The front view showing the surface roughness detection apparatus of a bill.

[Drawing 8]The sectional side elevation showing the surface roughness detection apparatus of a bill.

[Drawing 9]The block diagram showing the drive control system of the surface roughness detection apparatus of a bill.

[Drawing 10]Graph charts showing the relation between the temperature of a bill, and a wear degree.

[Drawing 11]Graph charts showing the relation between the humidity of a

bill, and a wear degree.

[Drawing 12] Graph charts showing the waveform of the pressure value outputted by the voltage element.

[Drawing 13] Graph charts showing the output distribution according to each cycle.

[Drawing 14] Graph charts showing the waveform of the pressure value outputted by the voltage element.

[Drawing 15] Graph charts showing the output distribution according to each cycle.

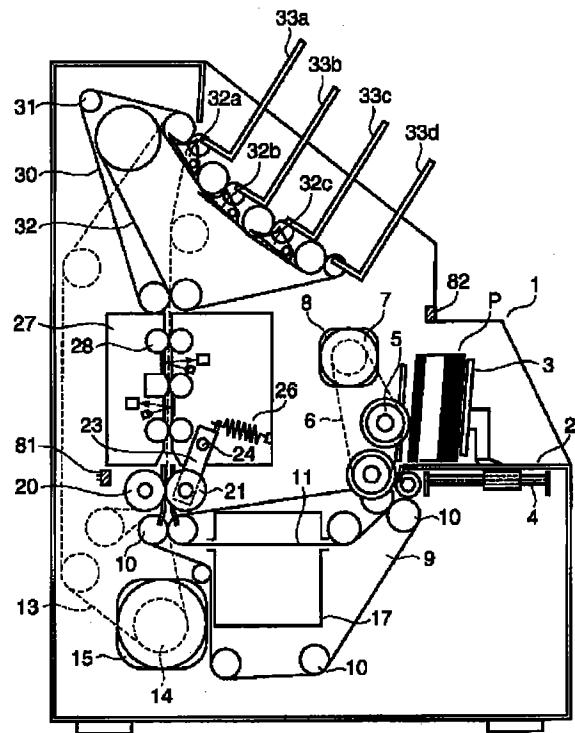
[Drawing 16] The front view showing the sensing device which detects the rigidity of a bill.

[Description of Notations]

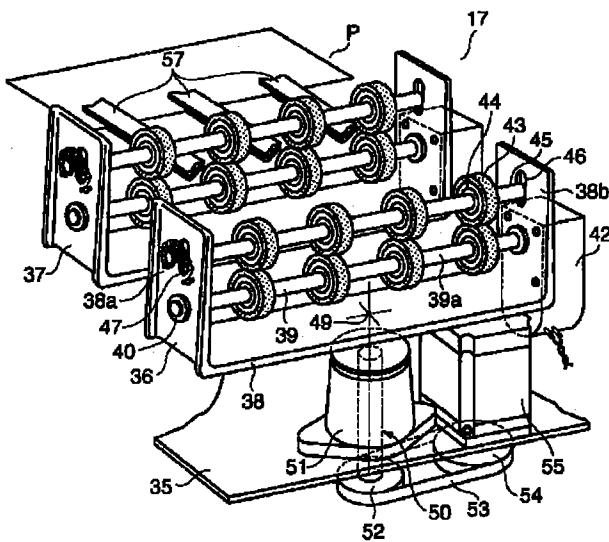
1 [-- Extraction roller (delivery means),] -- A device main frame, 2 -- A bill mounting base (seat part), P -- A bill (paper leaf), 5 9 -- A transportation means, 17 -- A posture correction device (positioning means), 20 -- Driving roller (roller pair), 21 -- A detecting roller (roller pair), 32a-32c -- Gating arrangement (variable means), 33a-33d -- An accumulation part (accumulation means), 71 -- Piezoelectric element (detection means), 81 [-- A driving roller (roller pair), 114 / -- A small roller (roller pair), 117 / -- Strain gage (detection means).] -- A temperature sensor (measuring means), 82 -- A humidity sensor (measuring means), 93 -- CPU (compensation means), 106

DRAWINGS

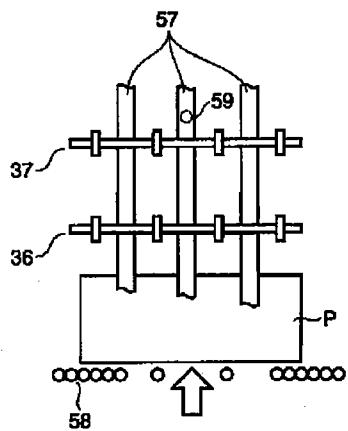
[Drawing 1]



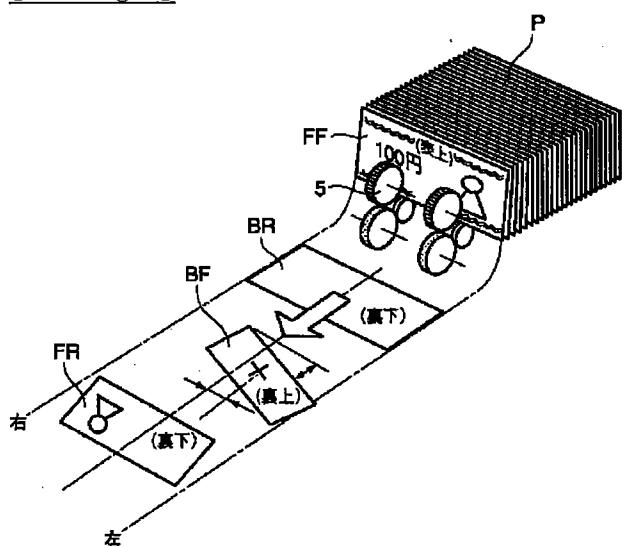
[Drawing 2]



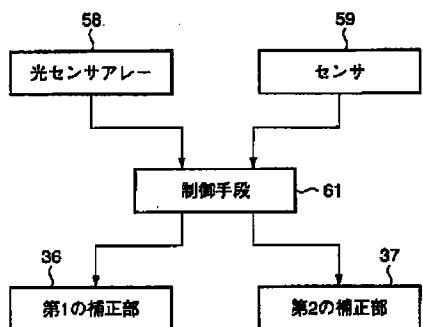
[Drawing 3]



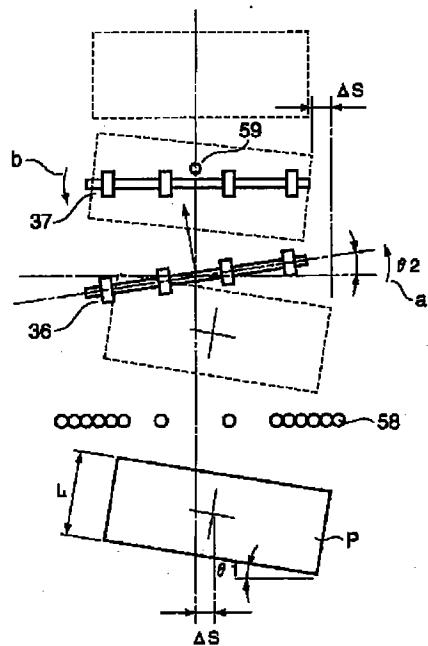
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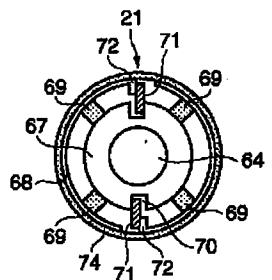
[Drawing 5]



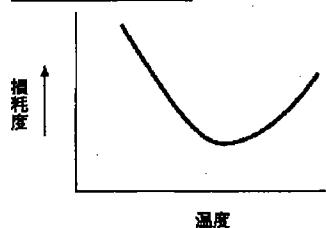
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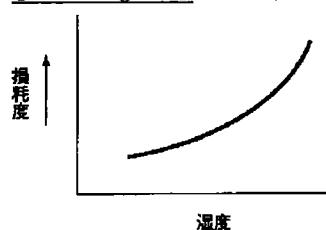
[Drawing 8]



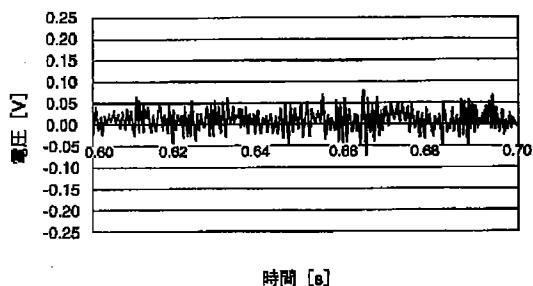
[Drawing 10]



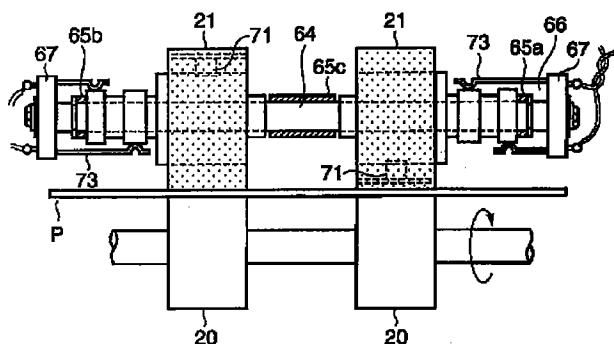
[Drawing 11]



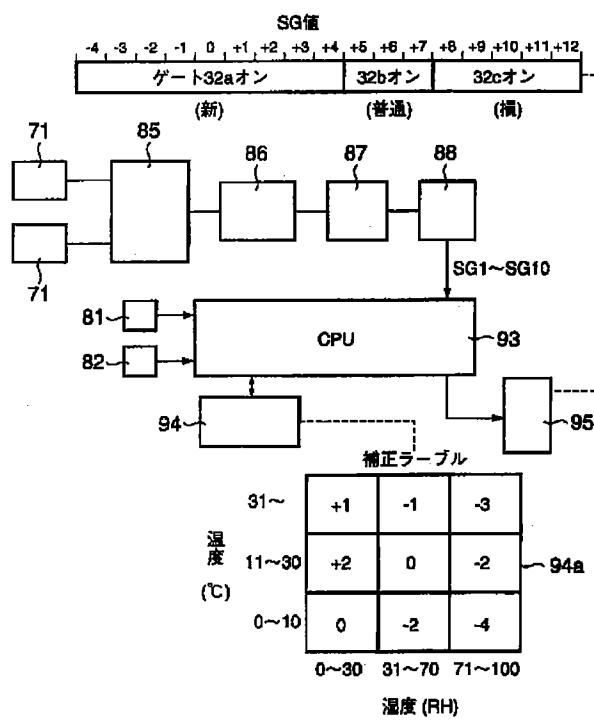
[Drawing 12]



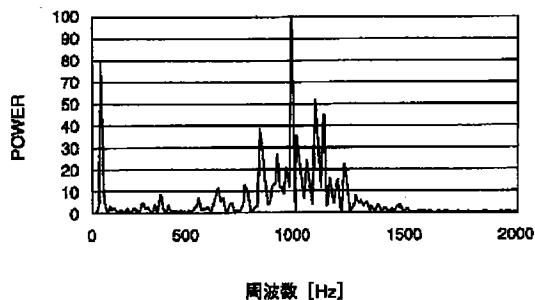
[Drawing 7]



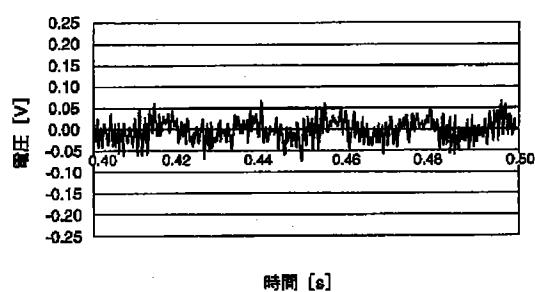
[Drawing 9]



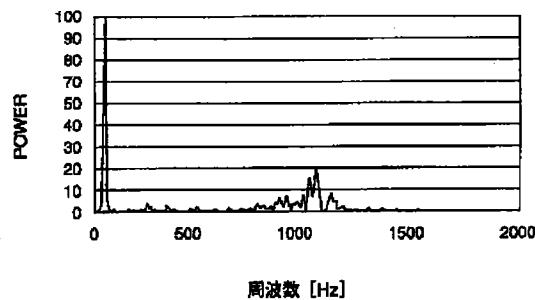
[Drawing 13]



[Drawing 14]



[Drawing 15]



[Drawing 16]

